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(ii) one or more secondary gas-solids separator means which are fluidly connected with the gas outlet conduit of the primary cyclone.

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AMENDED SHEET

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Applicants have now found that the combined primary and secondary cyclone separation means of the apparatus of the invention achieve a far better separation efficiency than the state of the art separation devices comprising conventional primary and secondary cyclone separators. With conventional cyclone separators is here meant having a design in which the gas outlet conduit significantly protrudes the cyclone housing from above. With significantly protruding the cyclone housing from above is especially meant that the protrusion equals between 0.4 and 1.2 times the height of the tangentially arranged feed-inlet opening. A typical conventional cyclone is exemplified in Fig. 17-36 of Perry's Chemical Engineers' handbook, McGraw Hill, 7th ed., 1997.

The invention is also directed to a fluidized catalytic cracking process making use of said apparatus. Moreover in a specific FCC application wherein stripping and primary separation are combined in one tubular vessel a combination of good separation and stripping efficiency can be achieved. Such an apparatus requires less additional means to discharge stripping gas and/or can be used with a higher stripping gas loading while the separation efficiency remains within the desired range. This was not possible with the above described prior art apparatuses.

With respect to the disclosed efficiency of the cyclone separators disclosed in the above cited article in Chemie Ingenieur Technik it is surprising that the combination of a primary cyclone and a secondary cyclone separation means of the claimed apparatus show such a high separation efficiency when a suspension containing relatively a high content of solids is fed to the primary

cyclone. This is especially surprising in view of the fact that it is not always obvious which measures will positively influence the overall separation efficiency of a coupled cyclone separation line up. For example when improving the separation efficiency of the primary cyclone by means of a known technical measure, increasing the gas inlet and/or outlet velocities in the primary cyclone separator, the overall separation efficiency of primary and secondary cyclone is not improved. Applicants have now found that this overall efficiency can be significantly improved when the apparatus according to the invention is used. In one example the particle content was reduced ten fold in the gas stream leaving the secondary separation means.

The invention shall be described in more detail below, including some preferred embodiments.

Detailed description of the invention

The invention is in particular directed to any one of the two embodiments described below.

The first preferred embodiment is an apparatus for separating solid particles from a suspension of solid particles and gas, wherein the apparatus comprises:

(i) a vertical primary cyclone vessel having a tubular housing comprising of a tubular wall section provided with a tangentially arranged inlet for receiving the suspension, a dipleg at the lower end of the tubular wall section, fluidly connected to the tubular wall section by means of a frusto conical wall section, and a cover which closes the upper end of the tubular wall section, wherein the cover is provided with an axial circular opening which opening serves as a gas inlet opening of a gas outlet conduit;

(ii) one or more secondary gas-solids cyclone separators which are fluidly connected with the gas outlet conduit of the primary cyclone.